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GPS-based high resolution mapping techniques in the Arno river for a correct flood risk management

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An extensive high-resolution GPS mapping survey has been carried out over the entire course of the Arno river within the Florence province (62km on each river's bank) in order to create a GIS database containing all the natural, urban, hydrological and morphological elements around the Arno and its principal tributaries within the Florence urban and suburban area.

The purpose of this project is to provide local public administrations with an helpful tool for managing hydrological risk, hydraulic policy and urban planning.

The geodatabase includes artificial and natural elements such as railways, roads, buildings, assets, bridges, administrative boundaries, hydraulic works, drainage outlets, dikes, hydro-morphological elements (such as bars or eroding banks) and so on.

All the mapped elements were georegistered and provided with alphanumerical descriptions, including the present condition of all elements, in order to plan ordinary and extraordinary maintenance works.

The spatial location of the elements is very accurate (less than $\pm$5cm error both in plan and in elevation), with special attention to the accurate positioning for all the elements of flood containment, both natural (riverbank line) and artificial (dikes or walls).

Such a complete and accurate database contains all the elements connected with the fluvial dynamic and with the hydraulic risk and will provide very accurate topographic and geometric data to be used in hydrological models.

Moreover, in our opinion, realistic assessments concerning hydraulic risk and flood

inundation cannot be obtained only with geometrical and topographical criteria (as currently happens with the Arno river), but should also include an evaluation of the stability of the dykes, most of which are old and have been built using heterogeneous materials in the period between First and Second World War. For this reason, the database has been integrated with geotechnical analyses and numerical modelling carried out on a test site along the Arno river course in order to establish a preliminary assessment of the criteria to evaluate dikes stability at large scale. The extension of such methodology to the whole mapped Arno dikes could provide in the near future a first attempt at integrating geotechnical dikes stability schemes into hydrological models for the prediction of flood risk.